VALUE ENGINEERING CONSTRUCTABILITY STUDY
OF
I-285 INTERCHANGE/SR 8/US 29
IM-NH-285-1(347)
PI No. 713320-

ATLANTA, GEORGIA
JANUARY 23, 2006

Prepared by:
VE GROUP, L.L.C.

In Association With:

Georgia Department of Transportation

VALUE ENGINEERING STUDY
TEAM LEADER

William F. Ventry, P.E., C.V.S.
C.V.S. Registration No. 840603(LIFE)

Date: _____

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I. INTRODUCTION

GENERAL

This Value Engineering report summarizes the results of the Value Engineering study performed by VE Group for the Georgia Department of Transportation. The study was performed on January 23, 2006.

VALUE ENGINEERING METHODOLOGY

The Value Engineering Team followed the basic Value Engineering procedure for conducting this type of analysis.

This process included the following phases:

1. Investigation
2. Speculation
3. Evaluation
4. Development
5. Report Preparation

Evaluation criteria identified as a basis for the comparison of alternatives included the following:

- Constructability
- Maintenance During Construction
- Utility Schedule
- Noise Impact to Locals
- Impact to Interstate Traffic
- Impact to Local Traffic
- Impact to Adjacent Interchange
- Salvage Value
- Construction Cost

I. INTRODUCTION

SUMMARY OF RECOMMENDATIONS

It is the recommendation of the Value Engineering Team that the following Value Engineering Alternatives be carried into the Project Development process for the final plans and specifications.

RECOMMENDATION NUMBER 1:

A. STAGE CONSTRUCTION

The Value Engineering Team recommends that **Value Engineering Alternative No. 1** be implemented. This alternative c*hanges the currently proposed method of correcting the elevation difference at the new bridge ends from closing the roadway to raising grades 4 feet, to making periodic incremental increases.*

The Value Engineering Team recommends that **Value Engineering Alternative No. 2** be implemented. This alternative *maintains traffic signals by utilizing wireless video detection.*

RECOMMENDATION NUMBER 2:

B. CONSTRUCTION TIME

The Value Engineering Team recommends that the Value Engineering Alternative be implemented. This alternative c*onsiders intermediate completion times that are not involved in the Georgia Power transmission line.*

RECOMMENDATION NUMBER 3:

C. CONTRACTOR WORK HOURS

The Value Engineering Team recommends that **Value Engineering Alternative No. 1** be implemented. This alternative r*evises work hours on Lawrenceville Road and in local residential areas.*

The Value Engineering Team recommends that **Value Engineering Alternative No. 2** be implemented. This alternative c*oordinates single and double lane closures on I-285.*

The Value Engineering Team recommends that **Value Engineering Alternative No. 3** be implemented. This alternative r*evises Special Conditions to remove "Portable Signs" and "Visibly."*

SUMMARY OF RECOMMENDATIONS (Continued)

RECOMMENDATION NUMBER 4:

D. TRAFFIC CONTROL/MAINTENANCE OF TRAFFIC

The Value Engineering Team recommends that **Value Engineering Alternative No. 1** be implemented. This alternative c*onsiders dedicated left turn lanes at the intersection on westbound Lawrenceville Road in Stage 2.*

The Value Engineering Team recommends that **Value Engineering Alternative No. 2** be implemented. This alternative r*evisits and clarifies the traffic control on the loop ramp.*

The Value Engineering Team recommends that **Value Engineering Alternative No. 3**. Be implemented. This alternative i*ncludes the Stone Mountain ramp in the construction plans.*

The Value Engineering Team recommends that **Value Engineering Alternative No. 4** be implemented. This alternative c*hanges temporary paint to temporary tape.*

RECOMMENDATION NUMBER 5:

E. MATERIALS

The Value Engineering Team recommends that **Value Engineering Alternative No. 1** be implemented. This alternative s*alvages the steel from the existing bridge.*

If this recommendation can be implemented, there is a possible savings of **$47,934.**

The Value Engineering Team recommends that **Value Engineering Alternative No. 2** be implemented. This alternative *uses Method I rather than Method II for the temporary concrete barrier.*

SUMMARY OF RECOMMENDATIONS (Continued)

RECOMMENDATION NUMBER 6:

F. CONSTRUCTABILITY

The Value Engineering Team recommends that the Value Engineering Alternative be implemented. This alternative *uses Drill Shaft foundation on the new bridges.*

If this recommendation can be implemented, there is a possible savings of **$222,079.**

II. LOCATION OF PROJECT

III. TEAM MEMBERS AND PROJECT DESCRIPTION

TEAM MEMBERS

NAME	AFFILIATION	EXPERTISE	PHONE
William F. Ventry, P.E., C.V.S.	VE Group	Team Leader	850/627-3900
Bruce Nicholson	VE Group	Construction	850-627-3900
Tom Hartley, P.E., C.V.S.	VE Group	Roadway Design/Traffic	850/627-3900
John Ledbetter, Jr., P.E., R.L.S.	VE Group	Structures	850/627-3900

III. TEAM MEMBERS AND PROJECT DESCRIPTION

PROJECT DESCRIPTION

The proposed project is the widening and reconstruction of the I-285 interchange at SR 8/US 29/Lawrenceville Highway. The existing bridge will be replaced. The project begins at the intersection of Frazier Road/McClendon Drive with Lawrenceville Highway and ends approximately 243 meters east of Rehoboth Baptist Church, a distance of 1.43 kilometers. A raised median will be constructed along Lawrenceville Highway from a point approximately 61 meters west of the intersection of Linkwood Lane/Spruce Valley Drive to a point 91 meters east of the intersection of Montreal Road South, east of I-285. All median openings will be signalized. The project includes improvements to Montreal Road North, west of I-285, from the intersection of Lawrenceville Highway north past the intersection of Hudson Road, approximately 0.8 kilometers, and to Montreal Road South, east of I-285, from a point approximately 224 meters south of Columbia/Northlake Regional Medical Center to the intersection with Lawrenceville Highway, a distance of 0.5 kilometers. The Montreal Road South intersection, east of I-285 would be relocated 61 meters east of its present location. Curb, gutter, and sidewalks will be constructed throughout the project.

IV. INVESTIGATION PHASE

VALUE ENGINEERING STUDY BRIEFING

I-285 INTERCHANGE/SR 8/US 29 JANUARY 23, 2006		
NAME	**AFFILIATION**	**PHONE**
William F. Ventry, P.E., C.V.S.	VE Group	850/627-3900
Bruce Nicholson	VE Group	850/627-3900
Tom Hartley, P.E., C.V.S.	VE Group	850/627-3900
John Ledbetter, Jr., P.E., R.L.S.	VE Group	850/627-3900
Lisa Myers	GDOT	404/651-7468
Mickey McMgee	GDOT	404/463-4939
Randy Hart	GDOT	404/656-5306
Christe Wilkinson	GDOT	404/699-4437
Sal Pirsod	GDOT	404/656-5442
Jack Muirheed	GDOT	404/656-5197
Neal O'Brien	GDOT	404/656-6442
Thomas Parker	GDOT	404/299-4386
Jerry Milligan	GDOT	404/463-2575
Sharon Evans	GDOT	404/635-8153
Mohsen Tehrani	GDOT	404/656-5442

IV. INVESTIGATION PHASE

The following areas have been identified by the Value Engineering Team as areas of focus and investigation for the Value Engineering process:

A. STAGE CONSTRUCTION

B. CONSTRUCTION TIME

C. CONTRACTOR WORK HOURS

D. TRAFFIC CONTROL/MAINTENANCE OF TRAFFIC

E. MATERIALS

F. CONSTRUCTABILITY

V. SPECULATION PHASE

Ideas generated, utilizing the brainstorming method, for performing the functions of previously identified areas of focus.

A. STAGE CONSTRUCTION

- Change the currently proposed method of correcting the elevation difference at the new bridge ends from closing roadway to raising grades 4 feet, to making periodic incremental increases.
- Plan to maintain traffic signals by utilizing wireless video detection.

B. CONSTRUCTION TIME

- Consider intermediate completion times that are not involved in the Georgia Power transmission line.
- Consider 3 stages of construction.

C. CONTRACTOR WORK HOURS

- Revise work hours on Lawrenceville Road and in local residential areas.
- Coordinate single and double lane closures on I-285.
- Revise Special Conditions to remove “Portable Signs” and “Visibly.”

D. TRAFFIC CONTROL/MAINTENANCE OF TRAFFIC

- Consider dedicated left turn lanes at intersection on westbound Lawrenceville Road in Stage 2.
- Revisit and clarify the traffic control on the loop ramp.
- Include the Stone Mountain ramp in the construction plans.
- Change temporary paint to temporary tape.

E. MATERIALS

- Salvage the steel from the existing bridge.
- Use Method I rather than Method II for a temporary concrete barrier.

F. CONSTRUCTABILITY

- Consider using drill shaft foundation on the new bridges.

VI. EVALUATION PHASE

A. ALTERNATIVES

The following alternatives were formulated during the "eliminate and combine" portion of the Evaluation/Development Phase.

A. STAGE CONSTRUCTION

Value Engineering Alternative Number 1: *Change the currently proposed method of correcting the elevation difference at the new bridge ends from closing roadway to raising grades4 feet, to making periodic incremental increases.*

Value Engineering Alternative Number 2: *Plan to maintain traffic signals by utilizing wireless video detection.*

B. CONSTRUCTION TIME

Value Engineering Alternative: *Consider intermediate completion times that are not involved in the Georgia Power transmission line.*

C. CONTRACTOR WORK HOURS

Value Engineering Alternative Number 1: *Revise work hours on Lawrenceville Road and in local residential areas.*

Value Engineering Alternative Number 2: *Coordinate single and double lane closures on I-285.*

Value Engineering Alternative Number 3: *Revise Special Conditions to remove "Portable Signs" and "Visibly."*

D. TRAFFIC CONTROL/MAINTENANCE OF TRAFFIC

Value Engineering Alternative Number 1: *Consider dedicated left turn lanes at intersection on westbound Lawrenceville Road in stage two.*

Value Engineering Alternative Number 2: *Revisit and clarify the traffic control on the loop ramp.*

Value Engineering Alternative Number 3: *Include the Stone Mountain ramp in the construction plans.*

Value Engineering Alternative Number 4: *Change temporary paint to temporary tape.*

VI. EVALUATION PHASE

A. ALTERNATIVES (cont'd)

E. MATERIALS

Value Engineering Alternative Number 1: *Salvage the steel from the existing bridge.*

Value Engineering Alternative Number 2: *Use Method I rather than Method II for temporary concrete barrier.*

F. CONSTRUCTABILITY

Value Engineering Alternative: *Consider using drill shaft foundation on the new bridges.*

VI. DEVELOPMENT PHASE

A. STAGE CONSTRUCTION

(1) AS PROPOSED NUMBER 1
(2) VALUE ENGINEERING ALTERNATIVE NUMBER 1
(3) AS PROPOSED NUMBER 2
(4) VALUE ENGINEERING ALTERNATIVE NUMBER 2

B. CONSTRUCTION TIME

(1) AS PROPOSED
(2) VALUE ENGINEERING ALTERNATIVE

C. CONTRACTOR WORK HOURS

(1) AS PROPOSED
(2) VALUE ENGINEERING ALTERNATIVE

D. TRAFFIC CONTROL/MAINTENANCE OF TRAFFIC

(1) AS PROPOSED NUMBER 1
(2) VALUE ENGINEERING ALTERNATIVE NUMBER 1
(3) AS PROPOSED NUMBER 2
(4) VALUE ENGINEERING ALTERNATIVE NUMBER 2
(5) AS PROPOSED NUMBER 3
(6) VALUE ENGINEERING ALTERNATIVE NUMBER 3
(7) AS PROPOSED NUMBER 4
(8) VALUE ENGINEERING ALTERNATIVE NUMBER 4

E. MATERIALS

(1) AS PROPOSED NUMBER 1
(2) VALUE ENGINEERING ALTERNATIVE NUMBER 1
(3) AS PROPOSED NUMBER 2
(4) VALUE ENGINEERING ALTERNATIVE NUMBER 2

F. CONSTRUCTABILITY

(1) AS PROPOSED
(2) VALUE ENGINEERING ALTERNATIVE

G. DESIGN COMMENTS

VII. DEVELOPMENT PHASE

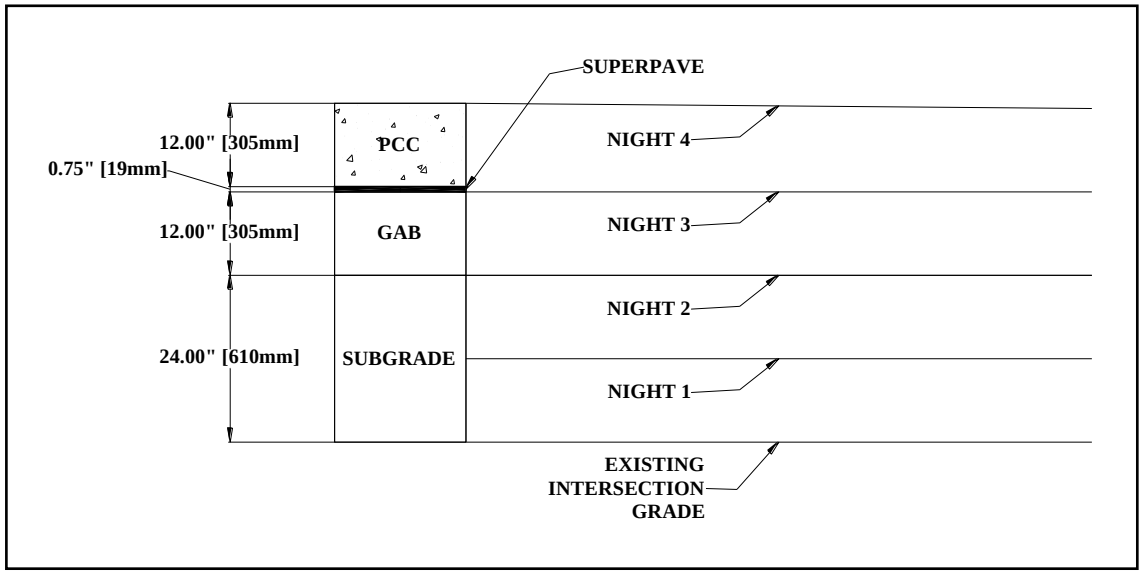
A. STAGE CONSTRUCTION

1. "As Proposed" Number 1

The profile of US 29/Lawerenceville Highway will have to be raised to accommodate the new bridge beam depths. The profile will have to be raised approximately four feet to allow proper vertical clearances for I-285. Raising the profile of US 29 impacts the Ramps L-3 and L-4 profiles as well. The current plan to address this is to leave this intersection at grade and when the traffic is switched from Phase I to Phase II, raise the intersection grade by 4 feet overnight.

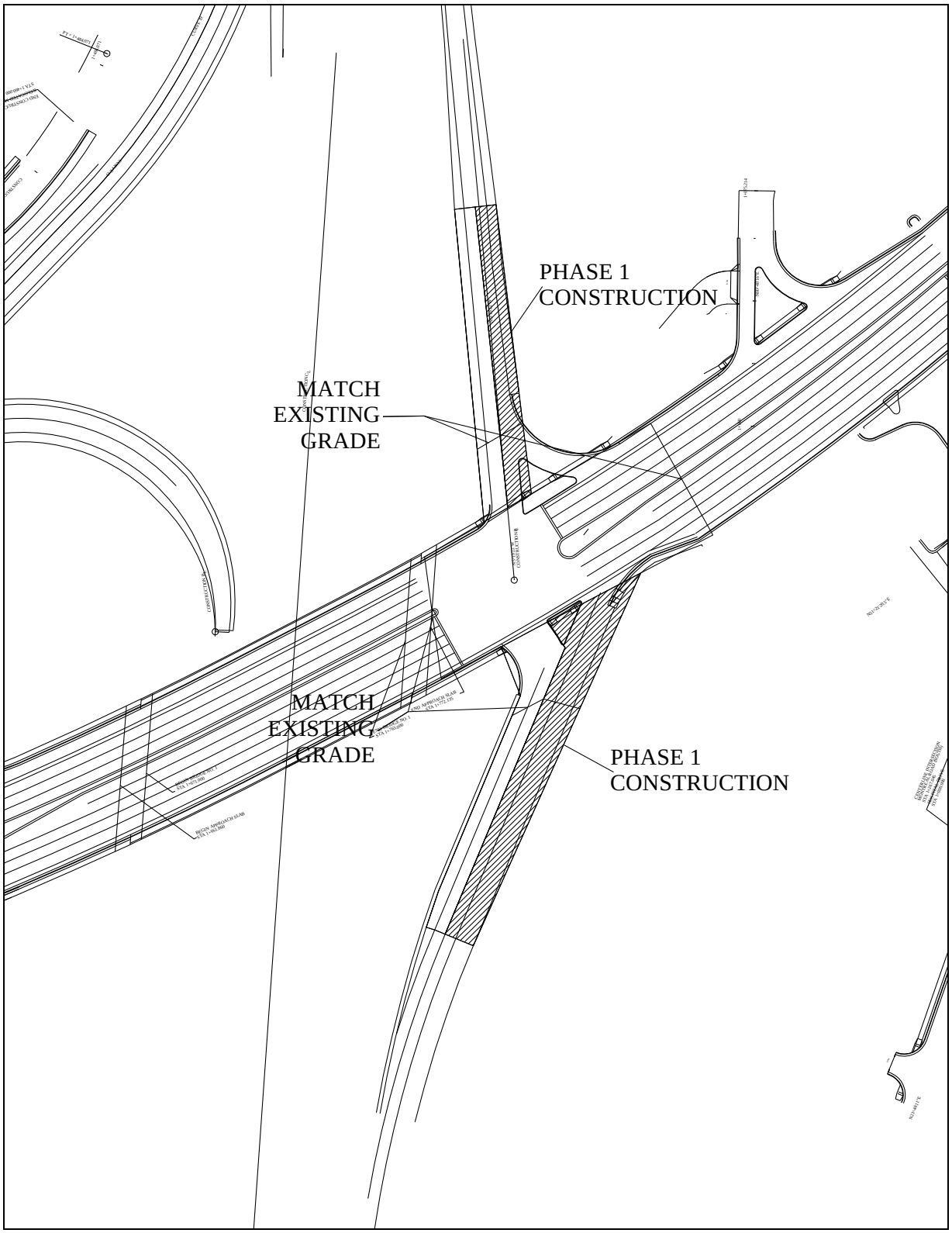
2. Value Engineering Alternative Number 1

The Value Engineering Team recommends raising the intersection grade over 4 to 5 nights after the new L-3 and L-4 ramp widenings have been completed. It is assumed three to four inch lifts per night. The maximum grades approaching the intersection will be 6.0% to minimize paving on the existing bridge.

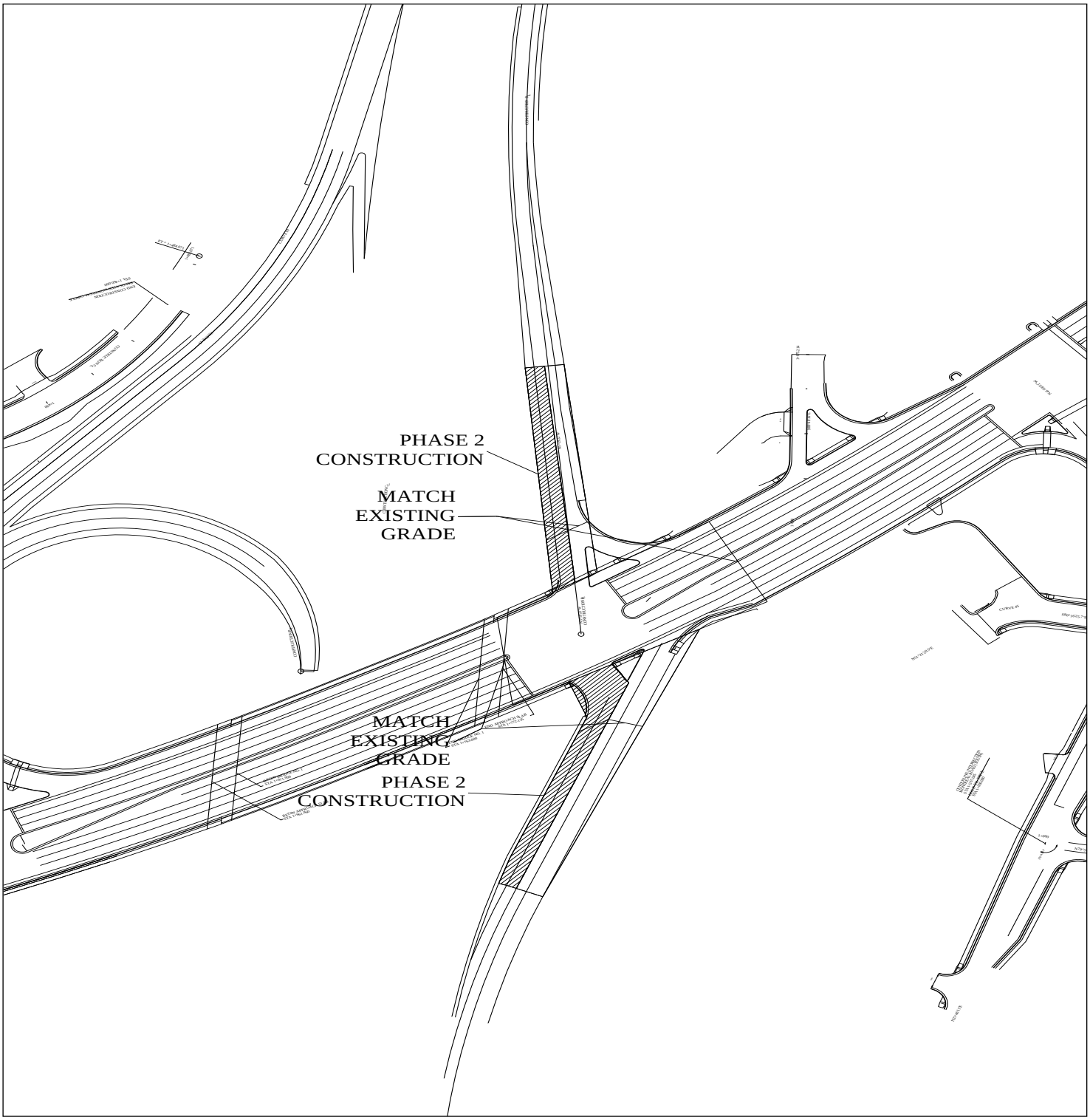


MATCHING NEW RAMP GRADES WITH INTERSECTION

Ramps L-3 and L-4 grades will have to be raised each night to meet the raised intersection. The maximum grade for the ramps will be limited to 6.0% to reduce the amount of paving on the ramps.



PHASE I OF RAISING INTERSECTION



PHASE II OF RAISING INTERSECTION

VII. DEVELOPMENT PHASE

A. STAGE CONSTRUCTION

3. "As Proposed" Number 2

PLANS TO MAINTAIN TRAFFIC SIGNALS:

The plans do not indicate any specific way to provide for temporary signals. It is assumed to be by the use of detector loops.

4. Value Engineering Alternative Number 2

PLANS TO MAINTAIN TRAFFIC SIGNALS:

The Value Engineering Team recommends the use of wireless video detection. This method reduces the risk of loss of detector loops during construction operations.

VII. DEVELOPMENT PHASE

B. CONSTRUCTION TIME

1. "As Proposed"

The proposed project consists of the construction of a new bridge over I-285 in 2 stages and widening US 29/Lawrenceville Highway to 6 or more lanes. The concept report recommends that a construction time of 2 years be established for the completion of this project.

2. Value Engineering Alternative

During the discussion of the construction time, the problem of the relocation of utilities was felt to be a potential controlling factor to the length of time required to build the project. A Georgia Power transmission line along Montreal Road (North), as well as their associated distribution lines was reported as requiring as much as 2 years to be relocated. There were other significant utility problems, such as Bell South which also needed relocation time, much of which had to be accomplished after completion of the Georgia Power work.

One of the alternatives discussed was to have an intermediate completion date for the project exclusive of the area involving the Georgia Power transmission lines. This would result in a construction time of 2 years for the Lawrenceville Highway/US 29 bridge and roadwork, then a suggested 6 months construction time for the roadwork along Montreal Road (North). This would change the project from 2 stages to 3 stages. Therefore, the project would have an overall construction time of 2.5 years.

The advantages of having this longer construction time include having potentially less problems with having to deal with time extensions. The utility owners would have more time to acquire right-of-way, develop plans and perform the work.

The disadvantages to extending the construction time include the fact that the public would be inconvenienced for a longer period of time. Also, there seems to be a mindset in the contracting industry that they are going to take as long as they have been given to complete a project. Another thought is that the Georgia Department of Transportation would prefer to give warranted time extensions rather than have extended construction times.

VII. DEVELOPMENT PHASE

C. CONTRACTOR WORK HOURS

1. "As Proposed"

A *Special Provision* is proposed for the construction of the interchange of I-285 and the Lawrenceville Highway/US 29 for the maintenance of traffic. This *Special Provision – Section 150.11 Special Conditions* is attached. *Section A* of this *Special Provision* regards the use of advance warning signs. *Section B* covers times when the contractor cannot install lane closures on I-285 or Lawrenceville Highway/US 29.

2. Value Engineering Alternative

A *Special Provision* is proposed for the construction of the interchange of I-285 and the Lawrenceville Highway/US 29 for the maintenance of traffic. Paragraph B uses the word "visibly" in reference to effecting traffic. This word needs to be removed so that any work that interferes with the free flow of traffic is prohibited.

There is also a considerable amount of language that is not included with this *Special Provision* for the maintenance of traffic:

- Restrictions for a single lane closure on I-285.
- Restrictions for a double lane closure on I-285.
- Restrictions for work hours or lane closures on Lawrenceville Highway/US 29 on weekends.
- Restrictions for work hours in residential areas in accordance with local ordinances or regulations.
- Restrictions for work on holidays or during times of special events.

The following table is recommended by the study team and indicates the hours when lane closures are not allowed:

	US 29 AND SIDE ROADS	**I-285**
Monday	6AM - 9AM & 4PM –7PM	5AM –9PM (single lane closure) 5AM – 10PM (double lane closure)
Tuesday	6AM - 9AM & 4PM –7PM	5AM –9PM (single lane closure) 5AM – 10PM (double lane closure)
Wednesday	6AM - 9AM & 4PM –7PM	5AM –9PM (single lane closure) 5AM – 10PM (double lane closure)
Thursday	6AM - 9AM & 4PM –7PM	5AM –9PM (single lane closure) 5AM – 10PM (double lane closure)
Friday	6AM - 9AM & 4PM –7PM	5AM – 10PM
Saturday	10AM – 7PM	10AM – 10PM (single lane closure) 10AM – 11PM (double lane closure)
Sunday	9AM – 7PM*	10AM – 9PM (single lane closure) 10AM – 10PM (double lane closure)

December 01, 2005

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

SPECIAL PROVISION

Project: IM-NH-285-1(347) DeKalb County
P.I. No. 713320

150.11 SPECIAL CONDITIONS:

A. For this project, the advance warning signs specified in Subsection 150.03.H shall be portable signs. These signs shall be in place only during times that construction is in progress or as conditions warrant as directed by the Engineer. Signs shall be removed or covered at all other times.

B. The Contractor shall not install lane closures or perform work or move equipment or materials in the traveled way that visibly interferes with traffic flow on major and minor streets between 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 7:00 p.m. Monday through Friday. The Contractor shall not install lane closure or perform work or move equipment or materials in the traveled way that visibly interferes with traffic flow on I-285 between the hours of 5:00 a.m. to 9:00 p.m. Monday through Friday, and 10:00 a.m. to 9:00 p.m. Saturday and Sunday. Equipment or materials moved on or across the traveled way at other times shall be done in a manner as not to unduly interfere with traffic. Contractor has the option to close the I-285 Northbound Entrance and Exit Ramp (Ramp L3 & L4) for one night between the hours of 10:00 pm to 4:00 am of the next day in order to construct the intersection. The I-285 Entrance and Exit Ramp (Ramp L3 & L4) and Lawrenceville Highway on both side of the intersection shall be constructed entirely prior to the closure of the ramps. The contractor shall maintain two-lane two-way traffic on Lawrenceville Highway during the closure of the ramps and intersection construction.

VII. DEVELOPMENT PHASE

D. TRAFFIC CONTROL/MAINTENANCE OF TRAFFIC

1. "As Proposed" Number 1

WEST BOUND LEFT TURNS

West bound traffic appears to lose the ability to make left turns into side streets and driveways.

2. Value Engineering Alternative Number 1

WEST BOUND LEFT TURNS

The Value Engineering Team recommends ensuring access is maintained to all the side streets and driveways on the south side of Lawerenceville Highway.

VII. DEVELOPMENT PHASE

D. TRAFFIC CONTROL/MAINTENANCE OF TRAFFIC

3. "As Proposed" Number 2

LOOP RAMP MOT

The proposed traffic control plan shows maintaining traffic on the existing ramp pavement and construction of the new pavement on both sides in Stage 1 and also during Stage 2, removing the existing pavement and constructing the new pavement between the Stage 1 new pavement.

4. Value Engineering Alternative Number 2

LOOP RAMP MOT

Because of the tight constraints for PCC placement, the Value Engineering Team recommends maintaining the traffic on the existing pavement and constructing new and temporary pavement outside Ramp L-2, and temporary pavement outside Ramp L-1 to accommodate the 2 one-lane ramps.

VII. DEVELOPMENT PHASE

D. TRAFFIC CONTROL/MAINTENANCE OF TRAFFIC

5. "As Proposed" Number 3

STONE MOUNTAIN RAMP

The Stone Mountain "on" ramp, which is in close proximity to this project, is not addressed in the proposed plans.

6. Value Engineering Alternative Number 3

STONE MOUNTAIN RAMP

Because of the close proximity to the Lawerenceville Interchange, the Value Engineering Team recommends adding the Stone Mountain Interchange Ramps on the plans to ensure construction does not introduce any adverse impacts to the Stone Mountain Interchange.

VII. DEVELOPMENT PHASE

D. TRAFFIC CONTROL/MAINTENANCE OF TRAFFIC

7. "As Proposed" Number 4

TEMPORARY TAPE:

The proposed design identifies paint for temporary pavement markings.

8. Value Engineering Alternative Number 4

TEMPORARY TAPE:

The Value Engineering Team recommends using *temporary tape* for pavement markings because of its durability and reflective characteristics.

VII. DEVELOPMENT PHASE

E. MATERIALS

1. "As Proposed" Number 1

The proposed project recommends the use of temporary concrete median barrier, Method Number II. This method is used for anchoring to a bridge and/or use in an area of less than 6 feet of offset from an object.

2. Value Engineering Alternative Number 1

Since the application for the use of temporary concrete median barrier does not require anchoring or is not immediately adjacent to a fixed object, the Value Engineering Team's recommendation is to use temporary concrete median barrier, *Method Number I.*

VII. DEVELOPMENT PHASE

E. MATERIALS

3. "As Proposed" Number 2

The existing bridge on Lawrenceville Highway/US 29 over I-285 was constructed by using steel beams. There is no information in the contract documents provided regarding the disposal of these beams when the existing bridge is removed.

4. Value Engineering Alternative Number 2

The recommendation of the Value Engineering Team is to include special notes regarding the salvage the existing steel bridge beams. Particular points where the beams are to be cut and the delivery point for the beams also need to be specified. By salvaging the beams and using an estimated value of $0.33 per kilogram, there could be a **cost savings of $47,934**.

MATERIALS
VALUE ENGINEERING ALTERNATIVE NUMBER 2
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
BRIDGE SALVAGE	KG	$0.33	0.0	$0	132,050.0	$43,577
SUBTOTAL				**$0**		**$43,577**
CONTINGENCY			10.0%	$0	10.0%	$4,358
GRAND TOTAL				**$0**		**$47,934**

POSSIBLE SAVINGS: $47,934

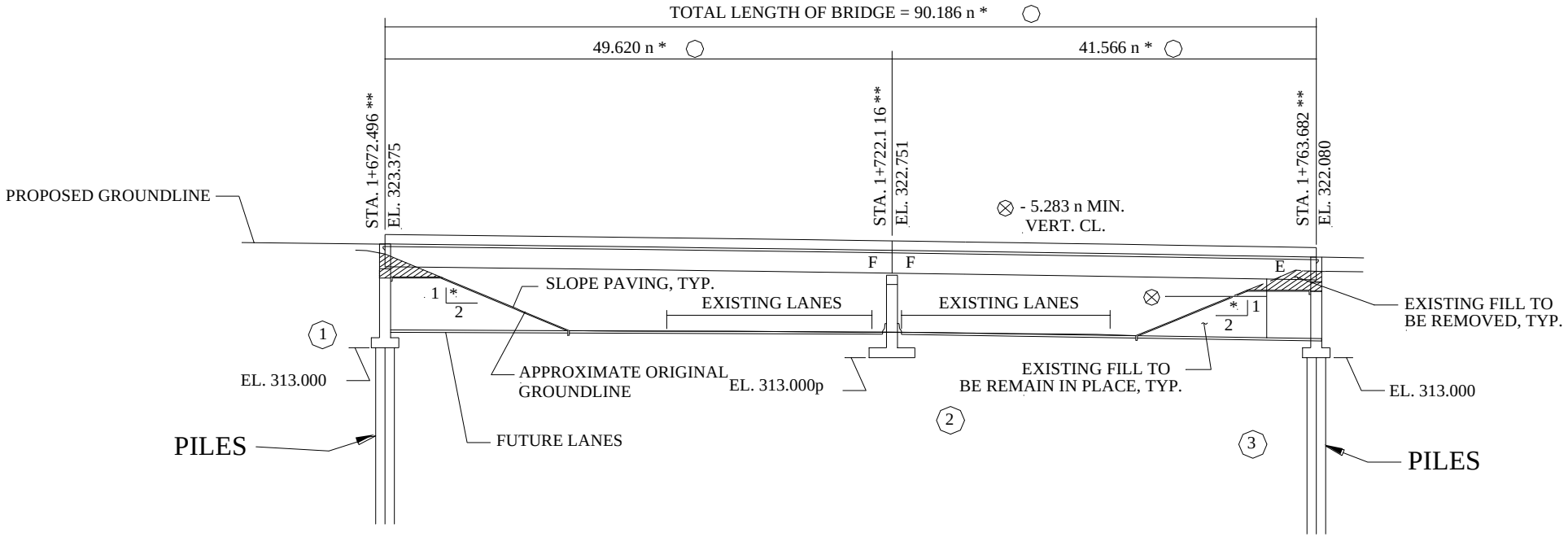
VII. DEVELOPMENT PHASE

F. CONSTRUCTABILITY

1. "As Proposed"

The proposed foundations for the replacement bridge consist of footings on piles for Bent 1 & 3 (End Bents), and spread footings for Bent 2. Because the End Bents are designed as interior bents to accommodate future lengthening of the bridge, the pile footings will be constructed below the grade of I-285. The use of footings on piles at this elevation will require shoring in order to maintain traffic during staging. The 2:1 end slope will remain in place until the bridge is lengthened, at which time the material around the end bents will be removed and become interior bents. The shoring will only be installed parallel to the centerline between the existing bridge and the staged construction of the proposed bridge. The excavation for Bent 2 in the median will require shoring on all sides. This method of foundation construction requiring driving of sheeting, excavation of material inside the shored area, building the footing formwork, and pouring the concrete is, at best, a time consuming process.

ELEVATION



As Proposed Bridge Foundation

VII. DEVELOPMENT PHASE

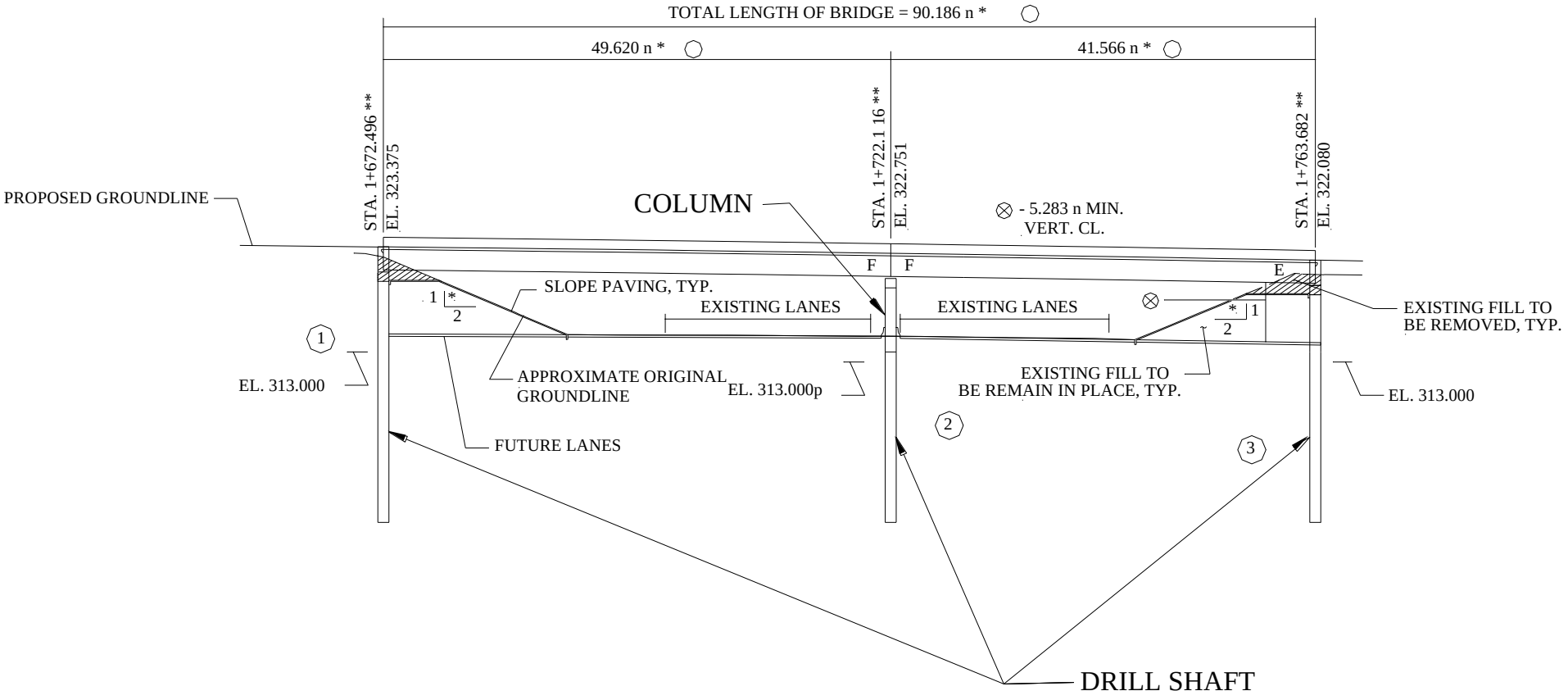
F. CONSTRUCTABILITY

2. Value Engineering Alternative

The Value Engineering Alternative consists of using Drilled Shafts at all Bents. The Drilled Shafts will be approximately the same diameter as the columns and will extend below and support the columns at Bent 2. At the End Bents the Drilled Shaft will become the column above the I-285 grade when the end slope material is removed and the bridge is lengthened. Because the Drilled Shaft is constructed inside a casing that extends to the ground surface, shoring, footing excavation, and forming, is eliminated. This speeds up the construction of the bents greatly and contributes to a safer work site. At the End Bents, a temporary form liner can be used in the borehole to insure that a smooth concrete surface will be exposed when the surrounding earth is removed.

The advantages of this alternative are that drilled shaft construction is cost effective and will reduce construction time. In addition, pile driving resulting in noise pollution will be eliminated.

ELEVATION



CONSTRUCTABILITY VALUE ENGINEERING ALTERNATIVE

CONSTRUCTABILITY
VALUE ENGINEERING ALTERNATIVE
COST COMPARISON

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
Bent#1 Shoring	SM	$430.00	250.0	$107,500		$0
Bent#1 Excavation	CM	$50.00	4,100.0	$205,000		$0
Bent#1 Footing	CM	$650.00	86.0	$55,900		$0
Bent#1 Column	CM	$650.00	54.0	$35,100		$0
Bent#1 HP 360 x 108	LM	$150.00	372.0	$55,800		$0
Bent#1 Drilled Shafts	LM	$4,000.00		$0	96.0	$384,000
Bent#2 Shoring	SM	$430.00	528.0	$227,040		$0
Bent#2 Excavation	CM	$50.00	246.0	$12,300		$0
Bent#2 Footing	CM	$650.00	203.0	$131,950		$0
Bent#2 Drilled Shafts	LM	$4,000.00			80.0	$320,000
Bent#3 Shoring	SM	$430.00	250.0	$107,500		$0
Bent#3 Excavation	CM	$50.00	4,100.0	$205,000		$0
Bent#3 Footing	CM	$650.00	86.0	$55,900		$0
Bent#3 Column	CM	$650.00	54.0	$35,100		$0
Bent#3 HP 360 x 108	LM	$150.00	372.0	$55,800		$0
Bent#3 Drilled Shafts	LM	$4,000.00			96.0	$384,000
SUBTOTAL				**$1,289,890**		**$1,088,000**
E&C			10%	$128,989	10%	$108,800
GRAND TOTAL				**$1,418,879**		**$1,196,800**

POSSIBLE SAVINGS $222,079

VII. DEVELOPMENT PHASE

G. DESIGN COMMENTS

1. The proposed signing and marking plans for Ramp L-1 has chevrons on the inside of the ramp curve. In accordance with Section 2C-10 of the *Manual on Uniform Traffic Control Devices*, "the Chevron Alignment signs shall be installed on the outside of a turn or curve, in line with and at approximately a right angle to approaching traffic." The proposed signing needs to be changed accordingly.

2. The longitudinal lines contained within a crosswalk should be parallel to the traffic lanes and not perpendicular to the transverse crosswalk lines. This is in accordance with GA Standard T-11. The marking plans should be drawn in this manner.